International Journal of Otorhinolaryngology and Head and Neck Surgery
Rao SUP et al. Int J Otorhinolaryngol Head Neck Surg. 2023 Apr;9(4):261-264
http://www.ijorl.com
pISSN 2454-5929 | eISSN 2454-5937

DOI: https://dx.doi.org/10.18203/issn.2454-5929.ijohns20230753

Original Research Article

A comparative study of isolation of microbial flora in ears

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Received: 27 January 2023
Revised: 16 March 2023
Accepted: 17 March 2023

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ABSTRACT

Background: Chronic otitis media (COM) is the middle ear's inflammation, characterized by ear discharge due to tympanic membrane perforation for at least over a month. The current study aims to study the microbial flora and its culture and sensitivity from ear discharge in chronic otitis media.
Methods: A comparative study was carried out in Bapuji Hospital and Chigateri district hospital, teaching hospitals attached to J.J.M. Medical College Davanagere over a year from 01 January 2022 to 01 January 2023 in all patients with a history and signs suggestive of chronic otitis media among 100 patients.
Results: In the current study, most patients were females (53%), with pus in the right ear (51%) and pus in the left. The most common microbial growth was of Pseudomonas species, and the difference was statistically significant.
Conclusions: Due to the variations in the collection and culture methods, it is difficult to understand the frequency of a polymicrobial illness thoroughly. Antibiotics have provided medics with a tool employed without a precise causal diagnosis.

Keywords: Chronic otitis media, Microbial flora, Culture and sensitivity

INTRODUCTION

Chronic otitis media (COM) is the middle ear's inflammation, characterized by ear discharge due to tympanic membrane perforation for at least over a month. The middle ear mucosa becomes irritated due to the underlying infection, which causes inflammation that causes discharge and eventually results in persistent tympanic membrane perforation.[1]

There are two basic classifications of COM: active when there is active inflammation and purulent discharge from the ear and inactive when there is no otorrhea, but this may occur at any time.[2]

Although Eustachian tube dysfunction is thought to be the underlying mechanism, the exact cause of COM is yet unknown.[3] Bacteria or viruses may also be quite important, especially in active COM. It is generally recognized that the bacteria linked to CSOM are very different from those linked to acute otitis media, typically brought on by viruses, *Haemophilus influenzae*, *Moraxella catarrhalis*, or *Streptococcus pneumonia* (e.g., respiratory syncytial virus).[3] *Pseudomonas aeruginosa* and *Staphylococcus aureus* are the two most prevalent aerobic bacteria found in COM. *Escherichia coli*, *Klebsiella*, and *Proteus* species can also be detected. Anaerobic bacteria, such as bacteroides or fusobacterium, can also contribute to active COM. Last but not least, in some circumstances, notably in immunosuppressed patients or after overtreatment with steroid-containing antibiotic drops, fungi (*Aspergillus spp.* and *Candida spp.*) may be detected.[4,5]

The condition manifests in childhood as a spontaneous tympanic membrane perforation brought on by acute middle ear infection (AOM) or a less severe secretory OM scream.[6,7] The most common cause of deafness in India is

COM, which takes up a significant amount of otolaryngologists' clinic and operating room time.[8]

In addition to its high prevalence and chronicity, COM has drawn significant attention due to problems including bacterial resistance and ototoxicity from topical and systemic antibiotics.[9] It is important to study microbial flora in COM and its antibiotic sensitivity. The current study aims to study the microbial flora and its culture and sensitivity from ear discharge in chronic otitis media.

METHODS

This comparative study was carried out in Bapuji Hospital and Chigateri district hospital, teaching hospitals attached to J.J.M. Medical College Davanagere over a year from January 2022 to January 2023 in all patients with a history and symptoms suggestive of chronic otitis media. A sample size of 100 ears was planned. The study group included one hundred randomized swabs of ear discharge from patients of either sex attending the outpatient department of ENT. All patients with ear discharges unrelated to COM were excluded from the study sample.

Data collection method

Aural suctioning/cleaning was performed on patients who presented to the OPD with discharge emanating from their ears. A sterile aural speculum was inserted into the external auditory canal after cleaning the EAC, establishing a sterile conduit. After that, sterile cotton swabs were used to capture and collect the middle ear discharge or the discharge near the tympanic membrane, which was then sent to the lab for mycological and bacteriological analysis within 30 minutes. Gathering and processing of samples All samples were taken under rigorous aseptic conditions, transferred in sterile containers, and processed immediately following established protocols.[10]

Bacterial pathogens' identification microscopy (gram stain, shape, cell arrangement) and colony features were used to identify infections (colony morphology, hemolysis on blood agar, changes in the physical appearance of the differential media). Separate colonies of organisms were cultivated in nutrient agar (Oxoid, UK) for later use.

Biochemical tests

Gram-positive isolates were tested for catalase and coagulase tests. In contrast, biochemical tests for gram-negative isolated bacteria were tested for oxidase, triple sugar iron (TSI), sulphur indole and motility (SIM), urease production and citrate utilization.[10]

Statistical analysis

The categorical data was represented in the form of frequency and percentage. Association between variables will be assessed with Chi-square test. Quantitative data will be represented as mean and standard deviation (SD). A p value of <0.05 was considered to be statistically significant. Data was entered in Microsoft excel and analyzed by IBM statistical package for the social sciences (SPSS) version 25.

RESULTS

In the current study, 100 patients were recruited for the study, where the majority were females 53% and males 47% (Table 1).

Table 1: Distribution of gender within the sample (n=100).

Gender	N	%
Male	47	47.0
Female	53	53.0

In the current study, among 100 patients' majority had the presence of pus in the right ear 51% and the presence of pus in the left was reported in 49% of the patients (Table 2).

Table 2: Distribution of pus culture side within the sample (n=100).

Pus culture	N	%
Left	49	49.0
Right	51	51.0

The culture of *Escherichia coli* (19%), *Klebsiella* species (7%) and *Staphylococcus aureus* (7%). The current culture yield showed that most patients had *Pseudomonas* species (47%), followed by coagulase-negative *Staphylococcus* (16%). Single microbial growth was seen in Commensals isolated Enterobacter, MRSA and *Staphylococcus hominus* (1%) (Table 3).

Table 3: Culture yield within the sample (n=100).

Culture yield	N	%
Coagulase-negative *Staphylococcus*	16	16.0
Commensals isolated	1	1.0
Enterobacter	1	1.0
Escherichia coli	19	19.0
***Klebsiella* species**	7	7.0
MRSA	1	1.0
***Pseudomonas* species**	47	47.0
Staphylococcus aureus	7	7.0
Staphylococcus hominus	1	1.0

In the current study, the culture yield compared to the side of the ear showed a statistically significant p-value (0.015) (Table 4).

Table 4: Culture yield compared to the side in the sample (n=100).

Culture yield	Left ear	Right ear	P value
	N (%)	N (%)	
Coagulase-negative *Staphylococcus*	9 (18.3)	7 (13.8)	0.015
Commensals isolated	1 (2.0)	0 (0.0)	
Enterobacter	1 (2.0)	0 (0.0)	
Escherichia coli	16 (32.7)	3 (5.9)	
Klebsiella species	3 (6.1)	4 (7.8)	
MRSA	1 (2.0)	0 (0.0)	
Pseudomonas species	17 (34.7)	30 (58.8)	
Staphylococcus aureus	1 (2.0)	6 (11.8)	
Staphylococcus hominus	0 (0.0)	1 (2.0)	

DISCUSSION

Chronic otitis media is the middle ear's inflammation, characterized by ear discharge due to tympanic membrane perforation. We have collected 100 ear samples from patients complaining of ear discharge. No known anatomical and genetic differences exist between males and females about the ear. Out of 100 patients recruited for the study, the majority were females, 53% and males, 47%. Similar study findings were reported by Olowookere et al.[11] However, few researchers have shown contrasting results, such as Abraham et al and equal gender predominance by Matnanda et al.[12,13]

In the current study, the presence of pus in the right ear (51%) and pus in the left was reported in (49%) of the patients. However, previous studies by Abraham et al infer that the right ear was affected more. The predominance of the left ear may be due to the random selection of the study cases. Still, no genetic or structural differences have been identified between the right and left ear.

Various studies have been performed previously, showing varied microbial growth results. An analysis of 100 ear pus swabs for culture revealed various microbial growth, the majority of the most common culture of *Escherichia coli* (19%), *Klebsiella* species (7%) and *Staphylococcus aureus* (7%). The current culture yield showed that most patients had *Pseudomonas* species (47%), followed by coagulase-negative *Staphylococcus* (16%). Single microbial growth was seen in Commensals isolated Enterobacter, MRSA and *Staphylococcus hominus* (1%). It shows a significance p value (0.015) with the side of the ear. Rohan et al have similar findings where *Pseudomonas* species were the most common.[14] In the study by Gupta et al and Abraham et al, *Klebsiella* species was the most common.[12,15]

Limitations

Geographical variation and difference in-patient population and antibiotic therapy was not considered in this study.

CONCLUSION

Due to the variations in the collection and culture methods, it is difficult to thoroughly understand the frequency of a polymicrobial illness, particularly the degree of an anaerobe's involvement. Before the advent of antibiotics, a complex COM was common. Although in our study, *Pseudomonas* and *Escherichia coli* are the main isolated bacteriae in chronic otitis media, *Klebsiella pneumoniae* and *Staphylococcus aureus* also played an additional role in COM in our study settings.

Recommendations

Early detection and appropriate therapy of COM is essential, especially in reducing the disease's consequences. Hence this study assumes significance in terms of early empirical intervention.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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Cite this article as: Rao SUP, Parveen JH, Nasser A. A comparative study of isolation of microbial flora in ears. Int J Otorhinolaryngol Head Neck Surg 2023;9:261-4.